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MALDEN

ON THE INTRODUCTION
OF THE NATURAL SCI-
ENCES INTO GENERAL
EDUCATION





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ON
THE INTRODUCTION

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OF

THE NATURAL SCIENCES
INTO GENERAL EDUCATION.

A LECTURE,

DELIVERED AT THE COMMENCEMENT OF THE SESSION OF
THE FACULTY OF ARTS, IN

UNIVERSITY COLLEGE, LONDON,
OCTOBER 15TH, 1838;

CONTAINING

REMARKS ON THE REGULATIONS ON THE SUBJECT OF EXAMINATIONS FOR
DEGREES IN ARTS LAID DOWN BY THE UNIVERSITY OF LONDON.

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ON
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My first and my most pleasant duty, in commencing the lectures of the present Session, is to congratulate our students that academic honours are at length accessible to them. The Universities of Europe were all formed originally on the same models; and however they may have been impressed with national peculiarities or modified by time, they still retain many features in common. They constitute a sort of learned confederation, the members of which are bound together, not only by participation in the same studies, and a general resemblance in their modes of mental culture, but by the visible bond of similarity in their organization and government, in their forms and ceremonies, in the titles which they confer, and the privileges which they enjoy. In every country of Europe they exercise a power of great moment in the working of the machine of society, the power of granting diplomas and conferring titles, which are received as the warrant of a liberal education. As the designations of academic degrees are the same, or very nearly the same, throughout Europe, they impart to those who bear them a literary rank, not only in their own country, but wherever learning is cultivated. It is this identity and universal acceptance of academic titles which

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has sustained their value, notwithstanding the undue facility with which they are granted in some instances. Into this great confederacy of learning our College is now admitted, in consequence of the establishment of the University of London, and our connexion with that body.

The first examination of the new University will be held this year; and our students will for the first time be brought into competition with the pupils of other institutions. Hitherto, however assiduous might be their industry, however extensive their attainments, however vigorous their intellectual growth, no reward was held out to them beyond that which is indeed the best reward of mental discipline, the consciousness of mental strength;—but no external reward was held out to them, except the prizes and certificates awarded amongst ourselves. Now for the first time they will receive a public attestation of their proficiency; and for the first time they will have an opportunity of attaining those distinctions and titles which are conferred by the elder Universities of Europe, and which are rendered venerable by their antiquity, and by their association with the names of all the learned of past ages; titles, which, however worthless a mere name may seem, have a substantial and practical value, so long as they are received by the world as a testimony and pledge of intellectual cultivation; and which have a real worth to the bearer of them, when they are attended by the consciousness that they have been earned by a severe course of mental discipline, tested by a judicious and rigorous examination.

It is manifest that the examinations for degrees must determine the course of study to be pursued by the candidates for degrees, and will affect the method of education in the Colleges connected with the University. No doubt, if the subjects of examination were selected with so little discretion, or the examinations themselves so ill conducted, that a course of preparation for them should not be a course of effective education, the Colleges might pursue their own

plans, and forego the purchase of the shadow by the substance : and if such an extreme case should ever occur, I trust that the teachers of this College would have self-confidence enough to adhere to their own convictions. But in the ordinary course of proceeding, it is plain that the examinations of the University will regulate the instruction of the Colleges and the studies of their pupils. It becomes therefore a matter of deep interest with us to consider thoroughly the Regulations on the subject of Examinations for Degrees in Arts, propounded by the University of London, which will come into operation this year, and to see what the path is in which the University would lead us.

In a discourse like the present I cannot attempt to enter into a minute examination of the details of the plan ; nor is it necessary to dwell upon those portions of it which accord with the practice of older Universities. Whatever crude opinions may be occasionally put forth by persons who are themselves ignorant of mathematics or classical literature, or whose minds have been engrossed by other pursuits, in this place, I feel assured, it is not necessary to undertake a formal exposition of the utility of these studies as instruments of education. If it be desirable that the mind should be practically acquainted with processes of pure reasoning, and be trained to the habit of considering and determining whether its own notions are consistent or inconsistent one with another, it is desirable that the study of Mathematics should form a large part of all liberal education. If we attach any value to the formation of habits of attention, and to the cultivation of the power of discriminating and of observing analogies, the study of the highly artificial and systematic languages of antiquity will be deemed a wholesome discipline of the mind. If we prize exactness in the use of speech, even in our own language, we shall encourage our pupils to study it in languages which are in themselves more exact, and on which, as new and external objects, the mind can fix an attention, such as, without this

discipline, it never can be taught to fix upon the mother tongue, which use has made too familiar to be so contemplated, and the idioms of which have become confounded with its own modes of conception. If we think that it exalts and refines the mind to contemplate the productions of genius the most elevated and the most equally sustained, and thus to be trained to a delicate perception of the intellectual beautiful, we shall think it right that the aspirants to a liberal education should proceed beyond the study of the mere languages of antiquity, and be able to read with intelligence and pleasure the great works of their literature, and especially the poets. If we believe that the statesman and the legislator, or even the simple citizen in this country of continually increasing freedom, can derive lessons of wisdom from seeing the working of republican institutions of every kind, from the closest oligarchy to the most unmitigated democracy that could exist in a state of society of which one of the conditions was slavery, on a scale large enough for the developement of their tendencies, yet small enough to be easily comprehended, sometimes laid bare with minute detail by unimpassioned observers, and in one great instance expounded by the most impartial and the most philosophic observer that ever recorded contemporary political events, at other times exhibited by the most eloquent advocates of party; we shall think it fit that all whose station in life will enable them to influence the greater movements of society, should study deeply the historians and orators of Greece: and if we believe that it may be a wholesome warning to contemplate the corruptions of democracy in a political body too large for self-government, and the possible magnitude of the vices and miseries of despotism, we shall continue to direct their attention to the history of republican and imperial Rome.

The succession of political events and the developement of conditions of society are not fortuitous, but follow certain laws, which depend ultimately upon the constitution

of the human mind; and, consequently, in the history of ages and countries widely remote, the same phenomena and the same changes may be traced, modified though they be to an indefinite extent by external circumstances. The states of antiquity passed through the same changes in their political condition as we have passed through and are now passing through; and ultimately, stages of decrepitude, into which, I trust, we may not be permitted to decline: and, therefore, I hold, that more political wisdom can be gathered from the philosophic study of ancient history than from the study of the history of modern Europe, which is only the history of our own childhood and youth.

In the writings of the philosophers of antiquity we behold the most powerful intellects, using as their instrument a language the most copious, the most flexible, and the most exact ever yet applied to philosophical speculations, exerting their utmost efforts to discover the laws of mind and the principles of morals. If then it be an ennobling discipline to follow the speculations of the original thinkers of the world; if it be desirable that those whose powers of mind dispose them to meditate on such subjects should know all that has been done before them, and be able to trace the sequence in which philosophical opinions have been suggested; if it be important that those whose high calling it is to enlighten the consciences of their fellow men should distinguish how much of our knowledge of moral law was attained by unassisted human reason, and how much we owe to the aid of revelation; then, education in the highest sense of the word, the education which is designed to form, not an adept in a profession, but an accomplished man, will continue to exercise its pupils in the palaestra of Greek philosophy.

I had not intended to dwell so long upon this portion of my subject. A zeal for my own pursuits (which, I hope, will not cause my arguments to be received with any distrust,) has led me to expatiate upon the benefits of the

study both of the classical languages and of classical literature. But I feel confident, as I said before, that with this audience at least the University of London needs not any such justification for including classical learning among the qualifications which it will require in all candidates for degrees in arts, and for awarding honours and prizes to an eminent proficiency in it. But there is a point on which greater difference of opinion may arise, a point in which the University of London has departed widely from the practice of the elder Universities of this country. After the first two years, when its plans will have come fully into operation, and all who seek its honours will have had due notice of the conditions upon which they are to be granted, it proposes to require from every candidate a considerable knowledge of several branches of natural science; not only of the mechanical laws of matter and motion, which can be subjected to mathematical calculation, as the University of Cambridge does, but also of Chemistry and of Vegetable and Animal Physiology. And not only will this knowledge be required in the final examination for Degrees, but no small portion of it will be demanded in the Matriculation examination: so that it will be necessary either that such knowledge should be taught in schools, or that students, after they enter the colleges, should devote at least a year to the acquisition of it, before they proceed to matriculate themselves in the University.

The great intellectual characteristic of modern times has been the successful prosecution of physical science. In poetry, in the fine arts, in oratory, in history, in philosophy, in jurisprudence, modern Europe has matched itself against the genius of Greece and Rome with worthy emulation, but, according to the most favourable judgment, with a doubtful superiority; and in some kinds we are compelled to admit that we have never yet attained to the standard of ancient excellence; but in physical science the nations of antiquity were but mere children in comparison with

the present age. The observations of their naturalists are still valuable ; but their attempts in mechanical philosophy only embarrassed the subject ; and of chemistry they knew nothing. From the time when Bacon in theory and Galileo in practice showed the mode of observing natural phenomena and investigating their laws, natural philosophy has advanced at a continually accelerated rate. But that which marks the present age even more than the progress of physical science, is the practical application of science to the purposes of daily life, to supply our ordinary wants, and to minister to our comfort in the smallest matters. Our streets are lighted, our houses are warmed, our clothes are woven, our cushions are made easy, we travel by land and by sea, we keep out the rain, we make our coffee, we light our candles, we perfume our rooms, by elaborate combinations of mechanical or chemical science. At the same time the knowledge of the animal and vegetable world has been greatly extended. Every year new species are discovered, and new products are applied to medical and economical uses.

When physical science was thus extending itself, and becoming daily more important in the practical concerns of life, and forcing itself in its application upon the notice of the most incurious, it is not surprising that an opinion should spring up, that instruction in its principles ought to enter more largely into the education of youth ; nor can it be said that such an opinion is unreasonable. Moreover, the very fact of the rapid increase of the physical comforts of life from the practical application of science has very much encouraged, if it did not originally generate, a disposition to measure the utility of everything by its tendency to contribute to our mere material and physical well-being. So much has been done for the corporeal part of our nature, that the spiritual has gone out of our thoughts, as if it were not worth attending to ; and we are disposed to set little store by the old-fashioned instruction, the only

end of which was to make us wiser and better. The reasonable desire that the education of the boy should be extended in proportion to the multiplication of the objects of knowledge which are to occupy the man, and the unreasonable and grovelling wish that all that is learnt should be capable of being immediately turned to account in money making, with no further view than the supply of bodily wants, and the purchase of bodily comforts, have produced a demand for a new species of education, which is united in many cases with a disposition to depreciate the old methods, and especially classical learning.

The University of London has so far assented to the popular opinion, that, without disparaging classical learning, or mathematical science, it requires in the earlier and later stages of a liberal education the addition of a considerable amount of physical knowledge. If it were possible for a young man simply to add this knowledge to the acquisitions in science and literature which he would make according to the ordinary course of education, to undergo the discipline of a mathematical and classical student, and at the same time to go through the peculiar training of an observer of Nature, no one could doubt of the beneficial tendency of the change. But if even the most industrious student cannot be expected to attain proficiency in all these various departments at the early age at which young men are usually candidates for academic honours, and if one study will be partially substituted for another, which I believe will be the case, a question may fairly be raised whether this change is in fact an improvement.

It is not my purpose, however, to raise this question upon the present occasion. My design is a more practical one. I am content to wait till the tendency of the course of study prescribed by the University has been ascertained by experience; and therefore I will not occupy your time and my own with an unprofitable criticism. As I am sincerely desirous that the experiment should be tried

under the most favourable conditions, I wish rather to point out in what manner, as I conceive, physical studies can be profitably introduced into the education of youth, and what method must be pursued in schools, which send their pupils to be matriculated in the University, in order to realise the advantages which the advocates of physical science expect to flow from its early cultivation.

In entering upon this discussion, I must lay down a proposition which may appear strange to those who have thought little on the subject, and which can appear strange only to those who have thought little on the subject.

The communication of knowledge is not the sole end of education. It is not even the chief end. I hold the communication of knowledge to be only a secondary object in education. I speak not here of moral education, with which our present discussion is not concerned: but in intellectual education, the first and great object is to develop and train the several faculties by exercises adapted to their growing strength, so that they may attain the highest possible degree of readiness and power,—not, be it observed, the highest degree to which any one may be forced at the expense of the rest, but the greatest vigour of which they are capable in harmonious co-operation, and thus to form a perfect man, perfect, I mean, in the healthy and robust condition of his whole intellectual being.

The office of education is not to make the child know many things which other children do not know, but to enable the *man* to apply his mind efficiently and confidently to any study, or profession, or business to which the duties of life may call him. A child or a man may know, or seem to know, many things, and yet have no one power of the mind, except the memory, strong and active. He may be slow or inaccurate in perception; not acute in distinguishing things that differ; little sensible of resemblances which are not merely external; not ready in combining

his knowledge, or in deducing conclusions from experience, or in proceeding from the particular to the general; dull in seeing the consequences of a proposition, or in foreseeing the consequences of an event; without a distinct consciousness of the limits of his own knowledge, or of the strength or weakness of his mental powers. Such an intellectual condition is likely to be the result, if, during the period of what has been misnamed his education, he has been merely the recipient of knowledge poured into him as into an empty vessel, and has not been trained to make it his own by gaining it laboriously and slowly by his own efforts. The very knowledge of a person so educated, however extensive it may seem to be, is sure to be feebly impressed upon his mind, indistinct, and inaccurate. On the other hand, it is quite possible for a man to possess but a limited knowledge of facts, and yet to have been trained to such mental habits as to be able to master any ordinary subject to which he may apply his mind, and, if it be of a practical nature, to judge correctly in it, and to act efficiently.

It is true that the intellectual faculties can be developed only by being exercised upon their proper objects, and that in every process of education knowledge of something must be acquired; but it is not true that the process in which the knowledge of most facts is acquired, is that in which the faculties are best trained; any more than that the dinner at which most is eaten is that by which the organs of digestion are most strengthened. Nor is it true that the knowledge which comes oftenest into practice, and consequently is the most useful in after life, is always the best adapted for the exercise and discipline of the immature faculties. It is quite possible that studies may be preferable for the purpose of training, which are of little practical utility in after life; and that a man may have derived great and lasting benefit from the exercise of learning something, while the thing itself is afterwards forgotten. No doubt, it is an

important problem in education to combine the communication of useful knowledge with the discipline of the mind. But it must ever be remembered, that where the mind is well trained, practical knowledge can be readily acquired afterwards; but where the training is defective, no amount of knowledge can supply the want. Yet nothing is more common than to find parents regardless and insensible of the growing intelligence of their children, and complaining that they do not learn at school those practical processes which are to subserve the routine of their future profession.

If the education of the body were the matter in question instead of the education of the mind, the absurdity of this conduct would be abundantly manifest. Put the case of a boy of a weakly constitution and effeminate habits; and suppose that family connexions and interest make it seem desirable that he should enter the army, and that he is committed to the care of some one,—an old soldier, if you like,—who professes to prepare him for his military career.

At the end of four or five years, when he ought to obtain his commission, his father may think it right to enquire into his fitness for his profession. — “Have you studied tactics?” — “No, sir.” — “Have you studied gunnery?” — “No, sir.” — “Are you perfect in the last instructions issued from the Horse-guards for the manœuvres of cavalry?” — “I have never seen them, sir.” — “Have you learnt the broadsword exercise?” — “No.” — “Can you put a company of infantry through their drill?” — “No.” — “Have you practised platoon firing?” — “No.” — “Can you even fix a bayonet in a musket?” — “I never tried, sir.”

After such an examination, we may suppose the father expostulating indignantly with the veteran under whose care his son had been placed. The latter might reply: — “Sir, when you entrusted your son to my training, he was weak and sickly: he had little appetite, and was fastidious in his eating: he could bear no exposure to the weather: he could not walk two miles without fatigue: he was inca-

pable of any severer exercise: he was unwilling, and, indeed, unable, to join in the athletic sports of boys of his age. Now he is in perfect health, and wants and wishes for no indulgence: he can make a hearty dinner on any wholesome food, or go without it, if need be: he will get wet through, and care nothing about it: he can walk twelve or fifteen miles a-day: he can ride; he can swim; he can skate; he can play a game of cricket, and enjoy it: though he has not learnt the broad-sword exercise, he fences well: though he has never handled a soldier's musket, he is an excellent shot with a fowling-piece: he has a firm foot, a quick eye, and a steady hand: he is a very pretty draughtsman: he is eager to enter his profession, and you may take my word for it, sir, he will make a brave and active officer."

Such a defence, I think, would be conclusive.—So it is with mental training. Mental health and vigour and activity are a sufficient vindication of the discipline by which they are produced, although the acquirements necessary for a business or a profession may have been delayed in the cultivation of them. There is no profession, no station in life, in which a love of intellectual exertion, a habit of attention, a retentive memory, a quick discernment, a comprehensive capacity, clearness of views, and soundness of judgment, a knowledge of the use of knowledge, that habit of mind, in short, which by experience and reflection gathers wisdom, is not far more valuable than any amount of mere knowledge.

Knowledge and Wisdom, far from being one,
Have oft times no connexion. Knowledge dwells
In heads replete with thoughts of other men;
Wisdom in minds attentive to their own.
Knowledge, a rude unprofitable mass,
The mere materials with which Wisdom builds,
Till smoothed and squared and fitted to its place,
Does but encumber whom it seems to enrich.

The question therefore to be determined is this : In what manner must the instruction of youth in physical science be conducted in order to render it an efficient mental discipline? Before we can answer this question satisfactorily, we must consider what mental faculties the study of physical science is fitted to exercise and develope. Objects are to be examined and phenomena observed : and thus, in the first place, the bodily senses are exercised ; and next, those faculties of the mind are brought into play, by which we take cognizance both of things, with their accidents of shape, size, position, and colour, and of events. Thus what is called the power of observation is strengthened, and habits of attention and accuracy are formed. When a considerable number of individual objects are known, differences and resemblances may be noticed, and the mind be taught to discriminate and compare. The individual objects, according to their differences and resemblances, may be divided into a species and comprehended in genera. The process of classification will thus begin, and the mind will be accustomed to intellectual order, and the methodical arrangement of its knowledge. In like manner, when a considerable number of phenomena have been observed, that which is accidental and extrinsic in the individual cases may be distinguished from that which is essential ; and thus the mind will learn to generalize. The relation of effect and cause will begin to be perceived ; the faculty which perceives it, and which instinctively seeks it, will be exercised ; and the mind will be gradually trained to recognise the relation where it subsists, and what is perhaps a habit more difficult to acquire, to abstain from supposing it where it has no real existence. In other words, it will learn the process of induction ; the only method by which any truth can be discovered, which is external to the mind itself, and not immediately an object of the senses. Thus, while mathematical science is the practical discipline of the pure reason, and literature cul-

tivates the imagination and the taste, and addresses itself also to the moral faculties; physical science, by its very nature, is fitted to exercise all those faculties, which are conversant with the material world and its phenomena.

But in order that it may really supply this discipline to the mind, it is absolutely necessary that the pupil should be employed with things themselves, and not merely with the names and descriptions of things; and that he should himself observe, himself compare and arrange, himself follow the processes of induction, and gradually be led to originate them; in short, that he should in a great measure make his science for himself out of facts ascertained by himself, and not receive it ready made either from the lips of a teacher or from books. This, I am aware, is not the speediest way of imparting knowledge; nor will it enable the young student to parade extensive acquirements; but it is the true mental discipline; and it is moreover the only way in which the foundations of true knowledge can be laid.

Science learnt merely from lectures or from books is little more than an exercise of the verbal memory, and is positively hurtful to the mind by accustoming it to be content with faint ideas and vague notions. In Chemistry, for example, a pupil may learn the names of the elementary substances, and of many of their combinations, and be able to tell of what these combinations are composed, and by what processes they are formed and analysed; he may be dexterous in manœuvring the symbols of chemical notation, and by this technical memory may register in his head a vast number of facts; and yet he may know nothing really of chemistry, and have exercised no one faculty of his mind except the memory of words and other arbitrary symbols. That he may really have ideas, he must himself see and handle and smell the substance of which he talks; and that his ideas may be vivid, and distinctly impressed upon his mind, he must see and handle and smell often. That he



may be trained to observe and to reason upon chemical matters, he must not only read about experiments; it is not even enough that he should see experiments performed by another; he must to some extent make experiments for himself. Half a dozen experiments made by himself will both give him clearer knowledge, and do more to form in him a scientific habit of mind, than a hundred experiments witnessed in the lecture-room. A teacher who seeks to convey a thorough knowledge of his subject, and to enable the learner to acquire knowledge for himself, will not be content with placing before him similar compounds, and telling him of what they are compounded, and why they are similar: he will make him himself observe and ascertain their similarity, whether from the resemblance of their external characteristics, or from the similar effects which they produce; and then make him analyze them for himself, and so learn experimentally the similarity of their constitution. The Practical Class is the class of mental discipline in chemistry. A student thus trained will not only acquire chemical knowledge, but he will know how to acquire a knowledge of anything else that can be submitted to his senses.

In like manner, if a student is to acquire a real knowledge of Botany, and if this science is to be made a mode of mental discipline, which is to supply the place of any part of that method of education by which our youth have hitherto been trained, it is not enough that he should learn by rote "the Characters and Differences of the principal Natural Classes and Orders of Plants belonging to the Flora of Europe, in the Botanical Classification of De Candolle;" it is not enough that he should hear from the lips of a teacher the definition of a family or a genus, and that a single species should be handed round in the class as a specimen. He should examine minutely several species, and know them familiarly by sight. He should himself find out the points of resemblance which constitute the generic

character, and mark the points of difference which distinguish the species. In Vegetable Physiology he must not merely be able to repeat accounts of microscopic observations which he has never verified. He must see with his own eyes the facts upon which the science is founded, and himself go through the processes of induction by which the functions of the several parts of a plant are ascertained. And though the knowledge thus gained may seem smaller in amount, and take a longer time in acquisition, than that which might be poured into the memory by an over-zealous teacher, it will be more lively and more permanent, and create in the process of acquisition a philosophic habit of mind. A quicker method and a greater amount of facts may be necessary in the preparation for a profession; but in this shape alone can Botany claim to be considered as a mental discipline, and an instrument of general education. Precisely the same remarks are applicable to Zoology, and to every other branch of physical science.

If then these principles are sound, it follows that, in order to render the study of physical science a wholesome mental discipline, the schools which profess to teach it must be very amply provided with the appropriate museums and the means of chemical experiment, as well as with instructors who will make use of these museums and laboratories in the practical method which I have attempted to describe. And if the University of London wishes that its graduates should go forth to the world with the same vigour of understanding as those who have been trained after the old fashion, it must take especial care to frame its examinations in physical science in such a manner, that the mere reader of books and listener to lectures shall not be able to pass through them.

I believe that the difficulty of forming the necessary collections is the reason which has prevented many intelligent schoolmasters from attempting to teach physical science, and has been the cause of the failure of the attempt in

many cases in which it has been made. That sect of educationists who affect to extol what they call real knowledge, and to decry the study of the classical languages and literature, talks much of the superiority of the study of things over the study of words. Their proposition is true in itself, but is generally entirely misapplied. The study of things is better than the study of words, because the pupil forms more vivid, more exact, and more permanent ideas of what he has immediately before him, than of what he only reads about and hears about. And, no doubt, the boy who has an air-pump in his hands, and performs experiments with it himself, is gaining more real knowledge, and training his faculties better, than if he were reading a criticism on the *Æneid* without having read the *Æneid* itself. But in most seminaries, however sounding their pretensions, the museum and the apparatus-room and the laboratory are scantily furnished: even pictures are soon exhausted: and the pupil goes on reading and hearing of animals and plants and minerals which he has never seen, and machines which he has never handled, and manufactures which he has never witnessed, of lemnures and cuttlefish, palms and eucalyptuses, selenite and steatite, and, it may be, even of divers protochlorides and deutoxides; and the teacher boasts that he is teaching things, while all with which he is loading the memory is mere words.

Even in the most simple and elementary teaching of things after the Pestalozzian model, it is much more easy than theorists are aware of, to fall into this error. There is a little book in great vogue, and of considerable merit, the "Lessons on Objects" as given in Dr. Mayo's school at Cheam; but I never yet saw this book in the hands of a teacher without finding that the little pupils during the greater part of their lesson were not really learning the properties of Glass, or Chalk, or Copper Wire, but were in fact learning the meaning of sundry hard words, such as "*transparent, opaque, friable, malleable, duc-*

tile, insipid, sapid ;" very useful knowledge, no doubt, but not exactly knowledge of things.

But when a boy is learning Greek or Latin, the words themselves are the things with which his mind is busied, and these he has perpetually before him. He is not merely told about them ; but he sees them, reads them, pronounces them, writes them, uses them. Every classical book that he reads is to him and his master an inexhaustible museum of them : he is always trying experiments with them with more or less success, analysing and compounding, that is, translating and writing exercises : and thus the ideas which he conceives of their formation and analogies, their derivation and composition, and the laws of their structure in sentences, attain at last to the distinctness and precision which belong to the ideas of objects with which the mind is immediately and practically conversant. In the spirit, if not in the letter, this is a study of things. And this I believe to be the cause, why the study of the ancient languages, even in those who do not carry it far enough to make much progress in the literature, is found, by an amount of experience which no theory can countervail, to be most beneficial in developing and strengthening the intellectual faculties.

The very great evil of accustoming a student to the use of mere phrases, without a distinct idea corresponding to them, and the very great difficulty which a young mind, without long previous training to habits of reflexion, has in realising to itself abstract metaphysical conceptions, renders it inexpedient, in my opinion at least, to enter upon the study of mental philosophy at an early age : and I think that the University of London has done wisely, in not requiring any knowledge of this kind in the matriculation examination ; in demanding but a small portion in the examination for the degree of Bachelor of Arts, and that portion relating only to the philosophy of the moral sentiments, which are more easily contemplated objectively by the intellect than

the acts of the intellect itself; and in reserving the philosophy of mind in general for the final examination for the degree of Master of Arts. The practical science of Logic is very properly required at the bachelors' examination.

After this discussion, I should have wished, if time had allowed me, to offer some practical advice to our students respecting the direction of their course of study. To a certain extent the regulations of the University allow no option, but require from all candidates "a competent knowledge" of all the branches of the examinations. But beyond this line, wherever the examiners may draw it, there is ample scope for the student to follow his inclinations or his judgment.

The first lesson which I would wish to enforce upon all young minds is the inestimable intellectual and moral benefit of studying at least one subject thoroughly, that is, to the utmost extent to which their powers will allow them to proceed. To those who had the good fortune to hear, and the wisdom to remember, the address of Mr. De Morgan delivered last year in this place, I need not insist further upon this point. Those who missed the opportunity, or lacked the wisdom, I would earnestly entreat to read that lecture, and to impress its principles deeply upon their minds.

The next point is the selection of the subject or subjects to be thus thoroughly studied. I estimate so highly the benefit of mathematical discipline, that I would advise every student without exception, to master thoroughly at least all the pure and mixed mathematics required in the ordinary examination, and not to leave any defect in this department to be compensated by his attainments in other branches; and I should be glad if those who feel conscious of the ability to prosecute such studies further, would proceed at least to the differential and integral calculus, and its application to the geometry of curves, and to easy mechanical and hydrostatical problems, and get such honours as they

may earn by this extension of their studies, even if they do not aspire to the highest mathematical distinctions. Those who are acquainted with the subject know that the step from simple geometry and algebra into the algebra and geometry of the calculus, is a step into a new field of reason, and a sure test of the intellectual strength of those who make it intelligently.

It will remain to be considered whether the rest of the time and labour of the student should be devoted to physical science or to classical literature. This is a question which will generally be determined by the ultimate destination of the student; and for this reason. The benefits of the study of physical science are the same in kind, to whatever extent it may be prosecuted. But this is not the case with classical learning. There is a certain benefit, and very great benefit, to be derived from the study of the ancient languages, and such a moderate knowledge of their literature as must be acquired in studying the languages. But the higher intellectual benefits which I attempted to point out in the earlier part of my discourse, the cultivation of the taste and the imagination, the insight into human nature and its springs of action and the working of political society, the profound acquaintance with philosophical speculation,—these are of another order, and can be attained only by a long and laborious course of study and meditation. Those students, therefore, who have no other object than to cultivate their minds thoroughly, and to make themselves well educated men, and who have full time for such a course of study, I would exhort to the assiduous cultivation of classical literature. But if the time of the student is limited, and he cannot hope to attain to the higher regions of classical learning, but must at an early age devote his time and labour to the cultivation of a profession intimately connected with physical science, the profession of medicine, for example, the profession of an architect or a civil engineer, or

the direction of any process of manufacture, such a student I would advise, not to aspire to any classical honours, but to be content with that knowledge of the ancient languages and of history which is required from all in the ordinary examination; and to devote his energy to physical science, and strive to earn one or more of the Certificates of Proficiency which are held out by the University, and which in this line of study are equivalent to their mathematical and classical honours. But let him, as he values his intellectual health and strength, at least lay the foundations of his knowledge in the practical manner which I have described.

J. H.
III. 5.
1847.

ON THE
RELATIONS OF FREE KNOWLEDGE
TO MORAL SENTIMENT.

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